

Small Mammal Monitoring at Cape Cod National Seashore

Robert P. Cook and Kelly Boland
Cape Cod National Seashore

Small mammals are an important component of the park's fauna. In addition to their direct contribution to species richness, they play a major role in trophic dynamics, consuming plant material and invertebrates, and in turn serving as prey items for a number of species of snakes, raptorial birds, and small to mid-sized carnivorous mammals. Through these relationships, small mammals may directly influence population levels of insect pests and disease vectors such as gypsy moths and deer ticks, as well as certain regionally rare hawks and owls. In addition, through secondary effects, small mammals have the potential to influence species up and down the "food chain". At Cape Cod National Seashore, small mammals are monitored to determine their abundance, distribution, and habitat relationships.

Small mammal monitoring at Cape Cod National Seashore began in 2000. Two sites/habitat in Heathland, Wetland, Grassland, Oak Forest, and Pine Forest were sampled. At each monitoring site, 100 Sherman live traps were deployed at 10 m intervals in a 90 m X 90 m square grid. Two sites were trapped each week, with 5 weeks required to complete a round of sampling at each of the 10 sites. A total of four rounds of sampling were conducted (late spring, early, mid, and late summer). Total trapping effort was 1,500 trap nights/site, for a total of 15,000. During weekly sampling, traps were set on Monday and checked once daily through Friday. All animals captured were identified to species, weighed, measured, sexed, aged, marked with a PIT tag, and then released at point of capture. Analysis to date has been preliminary, and is based on an index of abundance (number of individuals captured/100 trap nights, adjusted for disturbed traps). Differences in capture rates due to habitat and trapping period were tested for using two way analysis of variance. Ordination (Detrended Correspondence Analysis) was used to compare species composition between habitats, and species diversity by habitat was calculated (Shannon-Weiner diversity index, \log_2)

A total of 972 individuals representing nine species were captured. Two species of rodents, the white footed mouse (*Peromyscus leucopus*) and the meadow vole (*Microtus pennsylvanicus*), accounted for 69% of all individuals caught, and overall, rodents comprised 89% (Table 1). Based on all species combined, differences between habitats were significant ($p=0.006$) but those between the four sampling periods were not ($p=0.25$). For all species combined, small mammal abundance was greatest in oak forest and lowest in grassland (Figure 1). For the species showing significant habitat differences; white-footed mouse was widespread but most abundant in oak and pine forest; meadow vole was also widespread but most abundant in herbaceous-dominated wetland and grassland; masked shrew (*Sorex cinereus*) was most abundant in wetland; red-backed vole (*Clethrionomys gapperi*) occurred overwhelmingly in oak forest; Eastern chipmunk (*Tamias striatus*) was almost exclusively found in pine forest. (Tables 2 and 3).

Analysis of species composition by habitat suggests a pattern of small mammal community similarity organized along a gradient from herbaceous to woody plant dominance (Figure 2). Grassland and wetland differ from the other habitats due primarily to the abundance of meadow vole, meadow jumping mouse (*Zapus hudsonicus*), masked shrew, and long-tailed weasel

(Mustela frenata). Similarly, oak and pine forest differs due to the influence of red-backed vole, and southern flying squirrel (Glaucomys volans). Species diversity (H') was greatest in wetland (2.081) and lowest in pine (1.218), though pine had the greatest species richness (Table 4). This seeming disparity is due to the fact that pine habitat was overwhelmingly dominated by white-footed mouse but had small numbers of many other species.

While these results are based on a preliminary analysis of one year's data, they suggest that small mammal abundance is greatest in woodland and wetland habitats and lowest in grassland and heath. Distribution of species among habitats is fairly consistent with known habitat affinities. Certain species are widespread, but vary in abundance between habitats, probably as a result of food habits. The granivorous white-footed mouse appears to be most abundant in woody-dominated habitats and least in herbaceous-dominated ones. For the herbivorous meadow vole, the pattern is reversed. Other species appear to show stronger habitat affinities, masked shrew with wetlands, meadow jumping mouse with herbaceous habitat, and red-backed vole with oak forest. This latter was surprising, given the red-backed vole's known association with coniferous habitats, and may be due to the xeric nature of pine habitats on Cape Cod. With additional data collection in the coming years, further insight into habitat relationships, as well as trends in abundance will be more apparent.

Table 1. Summary of small mammal monitoring at Cape Cod National Seashore in 2000. Effort was 15,000 trap nights, 14,764 when adjusted for disturbance.

Species	# Individuals	# Captures	# Recaptures	Rel. Abundance	Inds/100 trapnights
<i>Peromyscus leucopus</i>	453	1229	772	46.6%	3.07
<i>Microtus pennsylvanicus</i>	212	422	209	21.8%	1.44
<i>Sorex cinereus</i>	97	98	1	10.0%	0.66
<i>Clethrionomys gapperi</i>	94	205	109	9.7%	0.64
<i>Zapus hudsonius</i>	90	115	25	9.3%	0.61
<i>Blarina brevicauda</i>	13	15	2	1.3%	0.09
<i>Tamias striatus</i>	5	11	6	0.5%	0.03
<i>Glaucomys volans</i>	5	8	3	0.5%	0.03
<i>Mustela frenata</i>	3	3	0	0.3%	0.02
Totals	972	2106	1127	100%	6.58

Table 2. Mean abundance (#inds/trap night), by habitat type, for each of 9 species at Cape Cod National Seashore. Bold indicates means that are significantly different at $p < 0.05$.

	Heathland	Wetland	Oak Forest	Pine Forest	Grassland	Overall Mean
All Species Combined	5.10	11.74	14.28	6.42	4.86	8.48
<i>Peromyscus leucopus</i>	3.30	3.52	8.20	5.38	1.31	4.34
<i>Microtus pennsylvanicus</i>	1.37	4.12	1.21	0.20	2.16	1.81
<i>Sorex cinereus</i>	0.41	2.21	0.22	0.34	0.00	0.64
<i>Clethrionomys gapperi</i>	0.00	0.00	4.36	0.30	0.30	0.88
<i>Zapus hudsonius</i>	0.00	1.73	0.00	0.00	1.31	0.61
<i>Blarina brevicauda</i>	0.00	0.10	0.13	0.21	0.31	0.09
<i>Tamias striatus</i>	0.03	0.00	0.00	0.20	0.00	0.05
<i>Glaucomys volans</i>	0.00	0.00	0.17	0.06	0.00	0.05
<i>Mustela frenata</i>	0.00	0.06	0.00	0.00	0.03	0.02

Table 3. Mean abundance (#inds/100 trap nights), by sampling period, for each of 9 species at Cape Cod National Seashore. Differences between sampling periods were not significant at $p < 0.05$.

	late spring	early summer	mid-summer	late summer
All Species Combined	5.41	9.66	9.09	9.76
<i>Peromyscus leucopus</i>	3.10	5.84	4.24	4.18
<i>Microtus pennsylvanicus</i>	0.90	1.74	2.37	2.23
<i>Sorex cinereus</i>	0.30	0.65	0.86	0.73
<i>Clethrionomys gapperi</i>	0.80	0.94	0.93	0.86
<i>Zapus hudsonius</i>	0.27	0.25	0.46	1.45
<i>Blarina brevicauda</i>	0.00	0.05	0.14	0.18
<i>Tamias striatus</i>	0.03	0.10	0.05	0.00
<i>Glaucomys volans</i>	0.00	0.50	0.30	0.11
<i>Mustela frenata</i>	0.00	0.03	0.03	0.03

Table 4. Species diversity, by habitat, of small mammal communities at Cape Cod National Seashore.

	Diversity Index	Species Richness
Heathland	1.348	4
Wetland	2.081	6
Oak Forest	1.573	6
Pine Forest	1.218	7
Grassland	1.750	6

Figure 1. Abundance by habitat, of small mammals species combined at Cape Cod National Seashore.

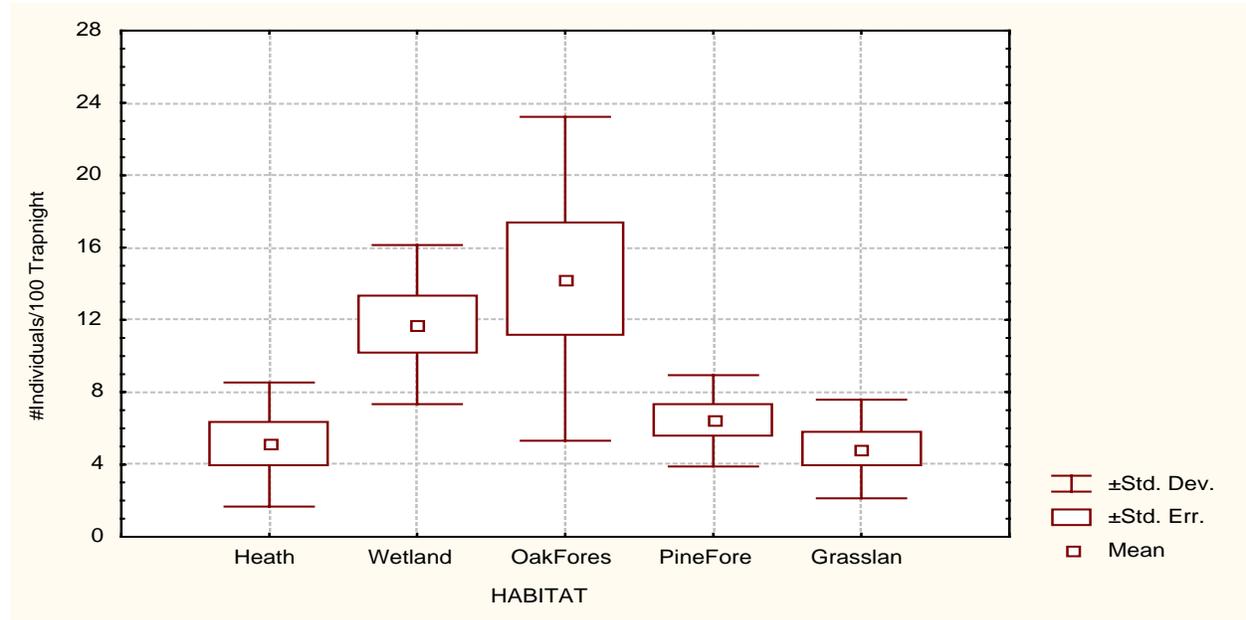


Figure 2. Similarity of small mammal communities at Cape Cod National Seashore.

